Zero Retries issue 0106 2023-07-07

Zero Retries is an independent newsletter promoting technological innovation in Amateur Radio, and Amateur Radio as (literally) a license to experiment with and learn about radio technology.

About Zero Retries

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Web version of this issue - https://www.zeroretries.org/p/zero-retries-0106

Request To Send

Editorial by Steve Stroh N8GNJ

Paid Subscriber Thanks

My very sincere ***Thanks*** to those subscribers that have chosen to be paid subscribers to Zero Retries. That show of support for Zero Retries is appreciated!

Two nice recent acolades from paid subscribers to Zero Retries, now part of the Zero Retries About page:

- *Zero Retries is the content I'm looking for, summarizing new tech and providing pointers to this generation's innovators*. - Chris Osburn KD7DVD
- *Zero Retries is easily the best of the amateur radio newsletters I've read since I became a ham in 1988*. - Florian Lengyel WM2D

What If? Writing

A long time Zero Retries reader recently said "you're doing a lot of what-if writing lately". Yes, I suppose I am. One reason is frustration about Amateur Radio, and especially the "leadership" in Amateur Radio… that just seems… *uninspired* (and uninspir*ing*). For example, other than mentions in Zero Retries… has the average Amateur Radio Operator been exposed to the impressive New Packet Radio (NPR) system… which has been available for *four years now*? In saying that, I'm not trying to claim sole credit for evangelizing NPR. One example is that NPR is getting some exposure amongst AREDN users as a longer-range complement to AREDN Networks.

But, after NPR being available for four years, *created* by an Amateur Radio Operator, *specifically* for Amateur Radio use, operating within *Amateur Radio spectrum*… doesn't it seem reasonable that NPR would get *some* mention in the Amateur Radio magazines? *I* cannot recall any such mention.

Channeling "El Supremo"

Two other long time Zero Retries readers have told me that Zero Retries (and especially some Request To Send editorials) remind them somewhat of the *Never Say Die* editorials in 73 Magazine by the late (*and great*) Wayne Green W2NSD who sometimes titled himself "El Supremo". The 43 years of 731 (1960 - 2003) overlapped my "formative years" in Amateur Radio and although W2NSD's editorials often ranged far afield of Amateur Radio, he did serve to inspire technological innovation in Amateur Radio. In my memory, W2NSD was early to champion innovations such as VHF / UHF repeaters, the use of FM in VHF / UHF (yes, that was a bit controversial for a time), and most notably the use of microprocessors and microcomputers in Amateur Radio2. The most notable aspect of 73, to me, was the "approachable" tone of W2NSD's editorials, 73's columns, and 73's articles. To me, the content in 73 read like I was having a conversation with the author as they would bring me up to speed on the subject of the article. Another aspect of 73 that I admired was the lack of "administrivia" such as contest results, organization changes, etc., ad nauseam. Thus, in being compared to W2NSD, I accept such a comparison as high praise!

Thus my hope for Zero Retries is that it *might help* "fill the gap" between what's known to be *possible*… and the technological innovation *actually happening* in Amateur Radio. Now that payment options for Zero Retries have been set up (and working - the first payments have been received), it's time to proceed on next steps to evolve Zero Retries to exert more influence in evangelizing technological innovation in Amateur Radio. It's a bit early to describe those plans, but suffice it to say that I'll be pretty busy in the coming months.

73,

Steve N8GNJ

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Image courtesy of Stockvault.net

The Ten Most Zero Retries Interesting Projects - Summer 2023 - Part 1

By Steve Stroh N8GNJ

Creating a Zero Retries Interesting "Top Ten" list.

I'm often asked "What's *New?*" (in reference to Amateur Radio and Zero Retries). Typically, I rattle off a few interesting projects that I try to follow in Zero Retries. But those conversations are ephemeral and rely on my aging memory, thus subject to change or omission.

Thus I decided to provide a ~~short~~ list of the ten most Zero Retries Interesting projects / products that I'm following. After writing the item about New Packet Radio, it was obvious that mentioning all ten, without resorting to severely cursory descriptions, would overflow a single issue of Zero Retries. So, this will be a two-parter.

Long term Zero Retries readers will probably have seen mention of each of these projects, but this is the first time that I've grouped these projects into a "Top Ten" list.

Part 1:

- ARDC - "Venture Capital" for Amateur Radio Projects
- AREDN - Microwave Mesh Networking
- New Packet Radio - A Fast Data Mode for Amateur Radio UHF
- RPX-100 - Software Defined VHF / UHF Radio with Reasonable Transmit Power
- VARA / VARA FM / VarAC - Fastest Data Communications Using Voice Radios

Part 2: (Future issue):

- M17 Project - A Digital Voice Ecosystem for Amateur Radio Using Open Source
- NinoTNC and Dire Wolf Software TNC / TNC4 - Packet Radio is Alive and Well in the 2020s
- ka9q radio - New Approach to Multi-channel VHF / UHF Receivers
- Selected Space Projects - The Most Interesting Frontier (In Amateur Radio)
- DLARC - Amateur Radio's Library for the 21st Century

Amateur Radio Digital Communications (ARDC) - "Venture Capital" for Amateur Radio Projects

ARDC provides largely unrestricted grants of varying amounts to Amateur Radio and other categories such as Education and Research and Development. ARDC's grants are unique within Amateur Radio because they are a stable source of funding[3]; ARDC's significant endowment allows it to be able to offer grants (potentially) in perpetuity.

Thus ARDC is able to fund *significant, challenging projects*, and most importantly, is willing to fund professional services and other large costs that can enable and accelerate projects unique to Amateur Radio such as:

- **M17 Project** - hardware (and other) development
- **FreeDV** - professional software development
- **TAPR TangarineSDR** - Revision of the Data Engine
- **Austrian Radio Amateur Society (OEVSV) RPX-100** - development expenses

And many other such projects.

While ARDC does not, on its own, currently develop Zero Retries Interesting projects[4], ARDC grants *enable* Zero Retries Interesting projects, thus justifying its inclusion on this list.

AREDN - Microwave Mesh Networking

Amateur Radio Emergency Data Network (AREDN) is alternative firmware for Wi-Fi and Wireless Internet Service Provider (WISP) radios that add a number of unique Amateur Radio capabilities to such units:

- Automatic Mesh Networking (that works[5]),
- Automatically, in the background, handles the networking administrivia such as Dynamic Host Configuration Protocol (DHCP) assignment of Internet Protocol (IP) addresses, Domain Name Service (DNS), etc.
- Configures the radio chipset to operate on Amateur Radio frequencies adjacent to the license-exempt 2.4 GHz and 5.x GHz bands,
- Can utilize high-bandwidth "static" point-to-point microwave links that are connected to a "AREDN-aware" router,
- Amateur Radio unique requirements such as lack of encryption and embedding of callsigns in each packet transmitted,
- "Newbie friendly" - can be installed on inexpensive Wireless Local Area Network (WLAN) units such as selected units from GL-iNet, and can begin networking via "tunnel" over Internet.
- Ongoing support, firmware updates, and promotion of Amateur Radio microwave networking.

AREDN has made microwave networking in Amateur Radio more approachable, more usable, and more popular than other microwave networking systems to date.

New Packet Radio - A Fast Data Mode for Amateur Radio UHF

In many ways, New Packet Radio (NPR) is the “next generation” Packet Radio system we have wanted ever since we began to bump into the limitations of AX.25 (and minor modifications, such as Net/ROM) and maximum over-the-air speeds of 9600 bps.

Amateur Radio Packet Radio networking was always envisioned to evolve to faster speeds such as 56 kbps using the WA4DSY 56 kbps modem and the TAPR Network Node Controller / PS-186 Advanced Network Controller. For various reasons… we didn’t realize that future… but New Packet Radio meets a lot of those requirements.

Despite the name, NPR has no commonality (*at all*) with Amateur Radio Packet Radio - not AX.25, not data modulations adapted for use with voice radios, etc. NPR does not interoperate with Amateur Radio Packet Radio other than AX.25 can be “tunneled” over TCP/IP networks like NPR, and vice versa.

Thus it’s puzzling why it has not been more widely implemented in (US) Amateur Radio. Here are some attributes of NPR:

- Designed specifically for Amateur Radio (embedded callsign for identification, no encryption, etc.).
- Fast - up to 500 kbps[6] in a 100 kHz channel in the 420-450 MHz band.
- Native TCP/IP - minimal overhead for TCP/IP (unlike Packet Radio over AX.25).
- Built-in repeater capability.
- Robust - incorporates Forward Error Correction (FEC) and Managed TDMA (Time Division Multiple Access); minimizes retries and collisions.
- Open Source - hardware, software, protocol.
- Mostly plug-and-play, assembled and tested hardware is available.

A few issues that may contribute to NPR not being used more widely:

- It’s an open source project, with only two vendors[7] [8] of hardware.
- Current hardware is specific to Amateur Radio 420-450 MHz band, no adaptations for other bands (to date).
- Depending on terrain and antennas, adequate[9] transmit power may be an issue.
- The primary reference for NPR is a Hackaday article, not a standalone web page.
- The hardware vendors are not large, and NPR hardware isn’t lucrative, so there’s no marketing, only word of mouth.
- The Fear, Uncertainty, and Doubt (FUD) factor of the legality / illegality of the data speeds (see footnotes).
- Inertia that NPR has no commonality with Amateur Radio Packet Radio; there is no “comfortable frame of reference” for understanding NPR for those with long experience with Amateur Radio Packet Radio.

NPR debuted four years ago now and the hardware, software, firmware, and protocol has evolved considerably and is largely available off the shelf for any group of experimenters that are willing to try something new. That Amateur Radio has NPR available, and to date, it’s not yet widely adopted in Amateur Radio, is unfortunate.

RPX-100 - Software Defined VHF / UHF Radio with Reasonable Transmit Power

The RPX-100 is a project of the Austrian Amateur Radio Society (ÖVSV), funded by a grant from ARDC, to create a multi-band (50-54 MHz / 144-148 MHz / 420-450 MHz) Software Defined Transceiver (SDT) with transmit power equivalent to typical VHF / UHF radios. A secondary goal of the RPX-100 project was to adapt OFDMA as channel access methodology based on the IEEE 802.22 (WRAN) standard for use in Amateur Radio[10].

It’s hard to follow the progress of the RPX-100 (the original website, www.rpx-100.net is offline as I write this - the link is partially cached via Internet Archive Wayback Machine). It’s likely still an active project given that there were multiple developers, sponsorship from ÖVSV, and funded by a grant from ARDC (see above).

A high-level overview of the RPX-100 includes these subsystems:

- Compute module
- Software Defined Transceiver module
- Filter and Pre-amplifier
- Power amplifier (30 watts)
- Transmit / receive antenna switch
- Power Supply

The compute module can be any generic embedded computer; the RPX-100 team mentions the Raspberry Pi Compute Module 4. Similarly, the Software Defined Transceiver module can be any SDT capable of being operation on Amateur Radio VHF / UHF frequencies; the RPX-100 team chose the Lime Microsystems LimeSDR Mini.

The only two aspects of the RPX-100 hardware that are unique in Amateur Radio (as far as I am aware) are the Filter and Pre-amplifier and the overall integration. All of the other elements are available as off-the-shelf modules.

To my knowledge, *nothing like the RPX-100 exists as a product available to Amateur Radio Operators*. Yes, there have been numerous Software Defined

Transceivers available that can operate on the Amateur Radio VHF / UHF bands, but none of those units provide the minimum transmit power (drive levels) that a typical Amateur Radio linear amplifier requires. Thus Software Defined Transceivers for Amateur Radio VHF / UHF bands are severely handicapped by unusable (for actual communication with fellow Amateur Radio Operators) transmit power levels.

Thus, Amateur Radio needs a *working, reference example* of a unit such as the RPX-100 (open source implementation strongly preferred so there are no Intellectual Property - IP issues) as a proof of concept *that such a radio is possible*.

VARA FM / VarAC - Fastest Data Communications Using Voice Radios

VARA FM is an elegant software package that integrates a number of techniques for data communications where the whole is greater than the sum of the parts. When VARA FM is used with a radio with a "flat audio" connection (often called the "Data Jack" or "9600 port", and suitable modem, VARA FM, it can achieve data speeds up to 25 kbps and do so with high reliability. Notably, VARA FM includes not only a "digipeater" capability but also can operate effectively over an analog voice repeater.

But one of the most notable capabilities of VARA FM is that it can be also be used with radios and modems that cannot achieve those maximum speeds. VARA FM can be used with radios that are connected "conventionally" to the speaker and microphone connections of any Amateur Radio VHF / UHF radio, and the modem can be nearly *any* audio interface.

For decades, Amateur Radio has had "high speed" and "low speed" data communications with 1200 bps Audio Frequency Shift Keying (AFSK) Packet Radio and 9600 bps Frequency Shift Keying (FSK) Packet Radio. However, the modulation techniques are dissimilar enough that that neither system recognizes the other, so they cannot be used effectively on the same channel as they will interfere with each other (collisions).

In contrast, VARA FM "fast" and VARA FM "slow" *are completely interoperable* and thus can share the same channel. (VARA FM's terminology for fast is "VARA FM Wide", and slow is "VARA FM Narrow".) The interoperability is achieved with a "handshake" exchange of the capabilities of each unit to the other, and the highest common speed is used.

VARA FM is Zero Retries Interesting not just because of its capabilities, but for *what it demonstrates is possible using commodity compute power*. VARA FM works as well as it does *because* ample compute power is available at reasonable price - a typical Windows PC with a multi-GHz, multicore processor with GBs of memory.

VarAC is a companion application that uses the VARA FM Application Programming Interface (API) to provide text chat, "email", file transfers, broadcasts, beacons, and many more features.

The combination of VARA FM and VarAC combines into a capable package for fast *and reliable* data communications. VARA FM + VarAC showcases *what's possible* with a "throw out the old paradigms" approach to making effective use of Amateur Radio's extensive VHF / UHF spectrum, even when balkanized into 20 or 25 kHz channels.

The Ten Most Zero Retries Interesting Projects - Summer 2023 - Part 2 will appear in a subsequent issue of Zero Retries.

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Embry-Riddle Aeronautical University (ERAU) Leverages ARISS for Outreach to 500 Grades 6-8 STEM Students

By Steve Stroh N8GNJ

One of the tenets of Zero Retries is that Amateur Radio can be used to engage students in STEM subjects, and this is a fantastic example of that approach. ARISS is Amateur Radio on the International Space Station.

ARISS Weekly Status Report - June 26, 2023:

> June 8: Embry-Riddle Aeronautical University (ERAU) in Daytona Beach, FL created an education initiative where the school and undergrads will invite 500 area sixth through eighth graders to engage them in a year of science, technology, engineering and math (STEM) activities. The target: students in socioeconomically challenged conditions. The program has the support of Nicole Stott. The capstone will be an ARISS contact. The school will involve Embry-Riddle student groups, the Daytona Beach Amateur Radio Association, and the educational non-profit group Tier One Two Aspire Leap Inc.. Pamela Peer, Embry-Riddle Director of Community Outreach & Summer Programs said activities like the ARISS initiative are essential for bringing young people into science and technology. Dr. Jim Gregory, College of Engineering Dean at Embry-Riddle said, "Through the ARISS radio project, Embry-Riddle will work to foster relationships with underserved students in our community to open meaningful pathways to STEM education and professions." ERAU's great web story about all of this is at https://news.erau.edu/headlines/stem-outreach-embry-riddle-to-connect-students-astronauts.

Nicole Stott is a retired NASA Astronaut.

Wow. Just… ***Wow!*** This is a *fantastic* program and a great example of leveraging Amateur Radio to reach and engage kids about STEM subjects. Kudos all around to the ARISS organization, ERAU, Daytona Beach ARA, and all the others named in this article. Also notable is that ERAU is leveraging its Amateur Radio Club and its STEM Outreach club in this effort. If you aren't familiar with ERAU, check out their impressive Degrees and Programs. If I was in my formative years as a young techie, ERAU would be on *my* short list of higher education to consider.

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ZR > BEACON

By Steve Stroh N8GNJ

Short mentions of Zero Retries Interesting items.

FreeDV vs HF RADAR Interference (FreeDV Wins)

From the digitalvoice mailing list:

> Hello .. just to demonstrate the extraordinary resistance to the interference of the North Korean radar .. FDV is totally immune .. in this short recording, it can be seen very clearly.

Listen to the short audio clip - The demonstration of FreeDV's Forward Error Correction (FEC) is *just remarkable*. This is one example why I think that data modes (which I include digital voice as part of) are going to revitalize use of the Amateur Radio HF bands, despite the rising levels of "civilization radio noise" such as ubiquitous sources of radio noise such as solar power systems, poorly designed switching power supplies, etc.

Using a Digirig Audio Interface for M17

Rob Robinette K9OJ on the Facebook Group **M17 Project (ham radio)**:

> I did a detailed how-to for using a $50 digirig mobile computer-radio interface with an FTM-200DR VHF/UHF dual band radio and free software to transmit and receive M17 - Using Digirig for M17 Transmit and Reception.

Digirig is a compact audio interface that's designed for use with portable radios (all kinds of portables, including low power HF radios for field use). Note that while K9OJ specifies a Yaesu FTM-200DR, *any* radio with a flat audio connection, such as a Kenwood TM-V71A, will work for this application. One of the best features of Digirig is that they offer a wide variety of cables for plug and play connections to various radios.

Also note that the combination of the host computer + Digirig + radio is, functionally, the M17 "radio". A microphone and speaker connected to the host computer's audio interface is also required.

Building an M17 Repeater

As I was reading through the above article, immediately following that article, Rob Robinette K9OJ also provides an interesting and detailed construction article on how he built a repeater dedicated to M17 - Building an M17 Repeater.

> My repeater is made up of these components:
>
> - **Repeater Controller:** Repeater Builder STM32_DVM_PiHat mounted on a raspberry pi 3+. I upgraded the STM32_DVM firmware to 1.6.0 for M17 support.
> - **Repeater Controller Software:** W0CHP WPSD dashboard based on pi-star. It supports M17 without modification. Chip's dashboard is far superior to the standard pi-star dashboard.

Plus, of course, the usual transmitter radio, receiver radio, duplexer, power supply, cabling, etc.

In fact, K90J's entire site is an interesting read, but he offers a lot of good Zero Retries Interesting info in the Ham Digital Modes section.

FCC Opens Shortwave Petition for Public Comment

From Benn Kobb AK4AV, Editor of (*the excellent*) Experimental Radio News newsletter:

> The FCC has opened for public comment the Petition for Rulemaking of the Shortwave Modernization Coalition.
>
> The proposal would bring new private, non-broadcast digital stations to the high-frequency spectrum.
>
> As covered in Experimental Radio News, the Coalition members have performed HF experiments over the last several years. Favorable FCC action on the proposal would open the field to regular commercial operations.
>
> The FCC has assigned the petition number RM-11953. Comments are due in 30 days.
>
> **FCC Public Notice:**
>
> https://docs.fcc.gov/public/attachments/DOC-394830A1.pdf
>
> **Petition:**
>
> https://www.fcc.gov/ecfs/document/1042840187330/1

"As covered in ERN" doesn't do justice to AK4AV's excellent coverage of the machinations of several companies that want to exploit HF spectrum formerly reserved for broadcasting. Such companies are literally "broadcasting to the world" with data rates appropriate for that spectrum, and thus their signals can be received by equipment as simple as a $30 Software Defined Receiver and potentially decoded with something as powerful and cost-effective as a Raspberry Pi 4 cluster. Thus, although these companies are undoubtedly being assured that their communications will be private through the use of encryption and proprietary techniques, I suspect it won't be long before such communications are rendered "not quite so private".

ARDC's New Community Manager is Rebecca Key KO4KVG

K04KVG introduced herself on the ARDC Community mailing list:

> Hey everyone! My name is Rebecca Key, KO4KVG, and I am the new Communications Manager at ARDC. I'm a chemist by education, earning my Ph.D. in Organic Chemistry from Georgia Tech. After 17 years in scientific research (roles ranging from Laboratory Technician to Research Director), I transitioned into the tech field, where I worked as a Front-End Engineer, building static websites and user interfaces for clients.

In addition to her QRZ page, KO4KVG has two personal websites - http://rebeccakeyphd.com and https://www.rfquests.com. I think ARDC scored another great staff member!

Leave a comment

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Join the *Fun* on Amateur Radio

If you're not yet licensed as an Amateur Radio Operator, and would like to join the fun by *literally having a license to experiment with radio technology*, check out
Join the Fun on Amateur Radio for some pointers.

Zero Retries Frequently Asked Questions (FAQs) — In development 2023-02.

Closing the Channel

In its mission to highlight technological innovation in Amateur Radio, promote Amateur Radio to techies as a literal license to experiment with radio technology, and make Amateur Radio more relevant to society in the 2020s and beyond, Zero Retries is published via email and web, and is available to everyone at no cost. Zero Retries is proud *not to participate* in the Amateur Radio Publishing Industrial Complex, which hides Amateur Radio content behind paywalls.

My ongoing ***Thanks*** to:

- Tina Stroh KD7WSF for, well, *everything!*
- **Founding Members who generously support Zero Retries financially:**
  Founding Member 0000 - Steven Davidson K3FZT
  Founding Member 0001 - Chris Osburn KD7DVD
  Founding Member 0002 - Don Rotolo N2IRZ
- Numerous Annual and Monthly subscribers who also generously support Zero Retries financially!

Want to Support Zero Retries?

- The *most* effective way to support Zero Retries is to simply mention Zero Retries to your co-conspirators that are also interested in knowing more about technological innovation that is occurring in Amateur Radio and encourage them to become a fellow subscriber.
- One particularly effective method of promoting Zero Retries is to add a mention of Zero Retries to your QRZ page (or other web presence) and include a link:

Zero Retries
An independent newsletter about technological innovation in Amateur Radio, promoting Amateur Radio as (literally) a license to experiment with and learn about radio technology.
By Steve Stroh N8GNJ
Subscribe

- If you'd like to financially support Zero Retries, that is *greatly* appreciated and helps offset expenses incurred in publishing Zero Retries. Paid subscriptions for Zero Retries are *entirely optional*, as explained in this special issue of ZR:
  Zero Retries Administrivia - Activating Payment Options.

These blogs and newsletters regularly feature Zero Retries Interesting content:

- Dan Romanchik KB6NU mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- Jeff Davis KE9V also mentions "Zero Retries Interesting" topics so regularly on his blog (that I otherwise wouldn't know about) that I've bestowed on him the honorific of Pseudostaffer.
- Amateur Radio Weekly by Cale Mooth K4HCK is a weekly anthology of links to interesting Amateur Radio stories.
- Experimental Radio News by Bennet Z. Kobb AK4AV discusses (in detail) Experimental (Part 5) licenses issued by the US FCC.
- TAPR Packet Status Register has been published continuously since 1982.
- Other Substack Amateur Radio newsletters recommended by Zero Retries.

These YouTube channels regularly feature Zero Retries Interesting content:

- HB9BLA Wireless by Andreas Spiess HB9BLA

- KM6LYW Radio by Craig Lamparter KM6LYW (home of the DigiPi project)
- Modern Ham by Billy Penley KN4MKB
- Tech Minds by Matthew Miller M0DQW

The Substack email publishing platform makes Zero Retries possible. I recommend it for publishing newsletters.

If you're reading this issue on the web and you'd like to see Zero Retries in your email Inbox every Friday afternoon, just click below to join ~~100~~ ~~200~~ ~~300~~ ~~400~~ *500* ~~600~~ ~~700~~ *800+* other readers:

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If you're a fellow smart person that uses **RSS**, there *is* an **RSS feed for Zero Retries**.

Zero Retries (N8GNJ) is on Mastodon — n8gnj@mastodon.radio — just click:

Zero Retries / N8GNJ on Mastodon

Email issues of Zero Retries are "instrumented" by Substack to gather basic statistics about opens, clicking links, etc.

More bits from Steve Stroh N8GNJ:

- SuperPacket blog — *Discussing new generations of Amateur Radio Data Communications — beyond Packet Radio (a precursor to Zero Retries)*
- N8GNJ blog — *Amateur Radio Station N8GNJ and the mad science experiments at N8GNJ Labs — Bellingham, Washington, USA*

Thanks for reading!
Steve Stroh N8GNJ / WRPS598 (He / Him / His)
These bits were handcrafted (by a mere human, not an Artificial Intelligence bot) in beautiful Bellingham (The City of Subdued Excitement), Washington, USA.

2023-07-07

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Blanket permission granted for TAPR to use any Steve Stroh content for the TAPR Packet Status Register (PSR) newsletter (I *owe* them from *way* back).

Tags for this issue:

73-Magazine ARDC AREDN ARISS Digirig FreeDV M17-Project NewPacketRadio Repeater RPX-100 STEM VarAC VARA-FM

1

I can't pass up an opportunity to mention that all 43 years of 73 Magazine are available online thanks to the Internet Archive and Digital Library of Amateur Radio & Communications. Special kudos to IA Archivist Kay Savetz K6KJN for doing the "grunt work" in securing the *permanent, no-question-about-it permission* for 73 to be online in perpetuitity via the Internet Archive.

2

Another notable magazine that W2NSD founded was Byte Magazine.

3

Post-publication clarification - In saying "stable source of funding", I'm trying to convey that *ARDC is stable*, as in will be able to continue to offer grants for the foreseeable future. *Not* to be construed (I don't speak for ARDC) that ARDC is willing to offer "perpetual" grants; to *my* knowledge, to date, ARDC is *not* willing to offer "perpetual" grants.

4

ARDC's other mission is support of 44Net. Although there is activity underway to enhance 44Net, to date that activity is almost entirely "behind the scenes" - survey, internal planning, internal prototyping, etc. To date, there is little "public facing" improvement of 44Net (at least that I can see as a public observer).

5

Over the years, there have been numerous automatic mesh network systems created for Wi-Fi and they have all failed for being proprietary, non-interoperable, applicable only to certain devices, etc. AREDN has succeeded in creating an automatic mesh networking system for Amateur Radio *that works*.

6

Yes… very technically, this speed exceeds the 56,000 symbols per second limitation in the FCC Amateur Radio (Part 97) rules. That such a limit is stupid and pointless (the "Stupid US" mode of NPR still uses a 100 kHz channel) seems an ideal reason to apply for a Special Temporary Authority to operate NPR units in the 500 kbps mode in the US.

7

https://www.tindie.com/products/kuek/new-packet-radio-modem-version-2-npr-h-20/

8

https://elekitsorparts.com/product/npr-70-modem-by-f4hdk-new-packet-radio-over-70cm-band-amateur-radio-packet-radio/

9

Definitions of adequate transmit power vary, of course. The "Tindie" unit transmits at 7W without need of an amplifier, and the Elekits unit requires a specific, external amplifier which has been hard to procure.

10

The choice of the RPX-100 team to implement 802.22 in Amateur Radio is a significant, notable, laudable choice and effort. But, that is a software / protocol choice, and given that the system is based on a *Software Defined* radio, the 802.22 implementation can be replaced with other choices of software / protocol. In this article I'm focused more on the RPX-100 hardware, because *there is currently nothing like it available as a product in Amateur Radio*, and such a system is badly needed to promote experimentation with Software Defined Radio technology on the Amateur Radio VHF / UHF bands.